



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
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## **Decision Rationale**

# **Total Maximum Daily Load for Shellfish Harvest and Primary Contact Use Impairments in the Poquoson River, Back Creek and Back River Watersheds, York County, Virginia**

*Signed*

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#### **I. Introduction**

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited waterbody.

This document will set forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDLs for the shellfish harvesting (bacteriological) and primary contact use impairments in the Poquoson River, Back Creek and Back River Watersheds. EPA's rationale is based on the determination that these TMDLs meet the following eight regulatory conditions pursuant to 40 CFR §130.

1. The TMDLs are designed to implement applicable water quality standards.
2. The TMDLs include a total allowable load as well as individual waste load allocations (WLAs) and load allocations (LAs).
3. The TMDLs consider the impacts of background pollutant contributions.
4. The TMDLs consider critical environmental conditions.
5. The TMDLs consider seasonal environmental variations.
6. The TMDLs include a MOS.
7. There is reasonable assurance that the TMDLs can be met.
8. The TMDLs have been subject to public participation.

#### **II. Background**

All of these watersheds discharge to the Chesapeake Bay. Table 1 documents the three major landuses and total acreage for each of the watersheds.

Table #1 – Watershed Landuses

Watershed	Area (sq. mi)	Percent Forest	Percent Agriculture	Percent Water/Wetland	Percent Developed
Poquoson River Back Creek	39	40	9	38	11
Back River	54	23	6	27	41

In response to Section 303(d) of the CWA, the Virginia Department of Environmental Quality (VADEQ) listed waters within the Poquoson River, Back Creek and Back River Watersheds as impaired on Virginia's 1998 Section 303(d) list for being unable to attain the production of edible and marketable natural resources use due to elevated levels of fecal coliform bacteria. The criteria are in place to protect the public from health affects associated with the consumption of bacteriologically contaminated shellfish. Waters within these watersheds were listed for failing to attain the primary contact use due to elevated levels of bacteria as well. These segments overlapped with the shellfish impaired segments in these watersheds. Therefore, the same TMDL methodology was used for both sets of TMDLs.

The impairment is based on restrictions placed upon the harvesting of shellfish from these waters. The restrictions which are issued by the Virginia Department of Health's Division of Shellfish Sanitation (DSS) are based on monthly monitoring data. DSS collects monthly fecal coliform bacteria samples from each of its sampling stations in the watersheds. DSS calculates geometric mean and 90<sup>th</sup> percentile concentration values based on the most recent 30-months of sampling data. The criteria calls for a 30-month geometric mean concentration of less than 14 most probable number (mpn)/100 millimeters (ml) and a 90<sup>th</sup> percentile concentration, based on the same 30-months of data below 49 mpn/100 ml. The criterion is identical to criteria developed under the National Shellfish Sanitation Program which is regulated by the U.S. Food and Drug Administration. Most of the stations were listed for failing to attain the 90<sup>th</sup> percentile criteria.

Fecal coliform is a bacterium which can be found within the intestinal tract of all warm blooded animals. Therefore, fecal coliform can be found in the fecal wastes of all warm blooded animals. Fecal coliform in itself is not a pathogenic organism. However, fecal coliform indicates the presence of fecal wastes and the potential for the existence of other pathogenic bacteria. The higher concentrations of fecal coliform indicate the elevated likelihood of increased pathogenic organisms. EPA encouraged the states to use *e.coli* and *enterococci* as the indicator species instead of fecal coliform in assessing the primary contact use because a better correlation was drawn between the concentrations of *e.coli* and *enterococci*, and the incidence of gastrointestinal illness. The Commonwealth adopted *e.coli* and *enterococci* criteria in January 2003. According to the new criteria, streams will be evaluated via the *e.coli* and *enterococci* criteria after 12 samples have been collected using these indicator species. Twelve *enterococci* samples were collected from these streams, and they are therefore, assessed according to the new criteria

As Virginia designates all of its waters for primary contact, all waters are required to meet the bacteriological standard for primary contact. The new criteria also established concentration based requirements for *e.coli* and *enterococci*. The *enterococci* criteria requires a geometric mean concentration of 35 colony forming unit (cfu)/100 millimeters (ml) of water with no sample exceeding 104 cfu/100 ml of water. Although the TMDL and criteria require the 104 cfu/100 ml of water concentration limit not be exceeded, waters are not placed on the Section 303(d) list if their violation rate does not exceed 10 percent. Therefore, these waters may be deemed as attaining the primary contact use prior to the implementation of all of the TMDL reductions. Tables 2a and b identify the TMDL loadings for the impaired waters.

Table #2a - TMDL Loading Shellfish Harvest Use Impairments (Fecal Coliform)

Watershed	Water	Segment/Condemnation Area	TMDL (MPN/day)	LA (MPN/day)	WLA (MPN/Day)	MOS
Poquoson River and Back Cr	Chisman Cr	VAT-C07E-23/137A	4.64E+11	4.36E+11	2.78E+10	Implicit
	Unnamed Cove	VAT-C07E-24/137B	1.15E+09	1.08E+09	6.90E+07	Implicit
	Patrick's Cr	VAT-C07E-07/137C	4.25E+10	4.00E+10	2.55E+09	Implicit
	Poquoson River	VAT-C07E-11/137D	2.11E+11	1.98E+11	1.27E+10	Implicit
	Lambs Cr	VAT-C07E-06/137E	7.03E+10	6.61E+10	4.22E+09	Implicit
	Roberts Cr	VAT-C07E-08/137F	1.73E+10	1.63E+10	1.04E+09	Implicit
	Lyons Cr	VAT-C07E	4.08E+10	3.84E+10	2.45E+09	Implicit
	Whitehouse Cove	VAT-C07E-09/137G	8.54E+10	8.03E+10	5.12E+09	Implicit
	Bennett Cr	VAT-C07E-08	1.49E+10	1.40E+10	8.94E+08	Implicit
	Eastern Cove	VAT-C07E	1.98E+10	1.86E+10	1.19E+09	Implicit
	Back Cr	VAT-C07E-10/151	2.51E+11	2.36E+11	1.51E+10	Implicit
Back River	Topping Cr	VAT-C07E-17/54-21A	2.61E+10	2.45E+10	1.56E+09	Implicit
	Cedar Cr	VAT-C07E-18/54-21B	1.60E+10	1.50E+10	9.60E+08	Implicit
	NW Br Back River	VAT-C07E-21/54-21C	8.69E+10	7.43E+10	1.21E+10	Implicit
	SW Br Back River	VAT-C07E-22/54-21E	1.13E+12	7.81E+11	3.51E+11	Implicit
	Tabbs Cr	VAT-C07E-19/54-21D	2.54E+10	2.06E+10	4.84E+09	Implicit
	Inlet #1	VAT-C07E-15/54-21F	6.34E+09	5.46E+09	8.88E+08	Implicit
	Harris River	VAT-C07E-14/54-21G	2.45E+11	2.11E+11	3.44E+10	Implicit
	Inlet #2	VAT-C07E-20/54-21H	2.91E+09	2.56E+09	3.49E+08	Implicit
	Wallace Cr	VAT-C07E-16/54-21H	2.02E+10	1.77E+10	2.42E+09	Implicit
	Front Cove	VAT-C07E-12/54-193A	1.60E+10	1.42E+10	1.76E+09	Implicit
	Long and Grunland Cr	VAT-C07E-13/54-158	6.21E+10	5.40E+10	8.07E+09	Implicit

Table #2b - TMDL Loading Primary Contact Use Impairments (Enterococci)

Watershed	Water	Segment	TMDL (cfu/day)	LA (cfu/day)	WLA (cfu/Day)	MOS
Poquoson River and Back Cr	Poquoson River, Upper	VAT-C07E-04	4.48E+11	4.21E+11	2.69E+10	Implicit
Back River	Brick Kiln Cr	VAT-C07E-21	2.40E+12	2.06E+12	3.36E+11	Implicit
	New Market Cr and SW Branch Back River	VAT-C07E-22	1.13E+12	7.81E+11	3.51E+11	Implicit

Many of Virginia's TMDLs, including the TMDLs for the Poquoson River, Back Creek and Back River Basins, have called for some reduction in the amount of wildlife contributions to the impacted streams. EPA believes that a significant reduction in wildlife is not practical and will not be necessary due to the implementation plan discussed below. A phased implementation

plan will be developed for all streams in which the TMDL calls for reductions in wildlife. In Phase 1 of the implementation, the Commonwealth will begin implementing the reductions (other than wildlife) called for in the TMDL. In Phase 2, which can occur concurrently to Phase 1, the Commonwealth will consider addressing its standards to accommodate this natural loading condition. After the completion of Phase 1 of the implementation plan, the Commonwealth will monitor the stream to determine if the wildlife reductions are actually necessary, as the violation level associated with the wildlife loading may be smaller than the percent error of the model. In Phase 3, the Commonwealth will investigate the sampling data to determine if further load reductions are needed in order for these waters to attain standards. If the load reductions and/or the new application of standards allow the stream to attain standards, then no additional work is warranted. However, if standards are still not being attained after the implementation of Phases 1 and 2, further work and reductions will be warranted.

### **III. Discussion of Regulatory Conditions**

EPA finds that Virginia has provided sufficient information to meet all of the eight basic regulatory requirements for establishing shellfish harvesting and primary contact use impairment TMDLs for the impaired waters. EPA is therefore approving these TMDLs. EPA's approval is outlined according to the regulatory requirements listed below.

#### *1) The TMDLs are designed to meet the applicable water quality standards.*

The waters were listed as impaired due to restrictions placed on the harvesting of shellfish as a result of excessive concentrations of fecal coliform bacteria in the water column. Virginia developed these TMDLs to insure that they would meet the applicable criteria of a 30-month geometric mean of 14 mpn/100ml and a 90<sup>th</sup> percentile of 49 mpn/100 ml. Most of the DSS monitoring stations within the impaired waters were unable to attain the 90<sup>th</sup> percentile criteria. The TMDLs were modeled by the Commonwealth using a volumetric load approach. The volumetric load approach was used for the primary contact use TMDLs as well.

The Commonwealth collected approximately 12-months of bacterial source tracking (BST) and fecal coliform data from the impaired areas. The BST data was collected from multiple monitoring stations within each impaired segment to determine the sources of fecal coliform to the watershed. The sources were broken down into four categories; human, pets, livestock and wildlife. An average percent loading per source category was obtained by summing the monthly percent concentrations and dividing that summation by 12. For the shellfish TMDLs, the Commonwealth determined the current 30-month geometric mean and 90<sup>th</sup> percentile concentrations for each condemned area. This data corresponded with the previously described BST data. Waters in which data was collected from multiple stations within a condemned area had the data volume weighted. The existing load was determined for each shellfish criterion by multiplying the existing 90<sup>th</sup> percentile and geometric mean concentrations by the impaired water volume. For the primary contact TMDLs the existing load was determined by multiplying the volume of water by the maximum observed concentration of enterococci. The allowable load for all of the TMDLs was determined by multiplying the applicable criterion by the volume of the impaired water. The required reductions were determined by subtracting the allowable load from the existing load. The 90<sup>th</sup> percentile

concentration was the more stringent shellfish criterion and was used for all the shellfish TMDLs. The primary contact TMDLs were all developed to insure compliance with single sample maximum enterococci criteria.

2 ) *The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.*

#### Total Allowable Loads

Virginia indicates that the total allowable loading is the loading derived by multiplying the more stringent criteria by the volume of water. The total allowable loading contains the sum of the loads allocated to land based precipitation driven nonpoint source areas (developed and agricultural land segments) and point sources. Activities that increase the levels of fecal coliform or enterococci to the land surface or their availability to runoff are considered flux sources. The actual value for total loading can be found in Table 2 of this document. The total allowable load is calculated on a daily basis.

#### Waste Load Allocations

EPA regulations require that an approvable TMDL include individual WLAs for each point source. According to 40 CFR § 122.44(d)(1)(vii)(B), “Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA pursuant to 40 CFR § 130.7.” Furthermore, EPA has authority to object to the issuance of any National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with the WLAs established for that point source.

In regards to the shellfish TMDLs, there are permitted dischargers of bacteria outside of the condemned areas for which the TMDLs were developed. DSS places a prohibition on the harvest of shellfish from areas around certain permitted dischargers where the bacteria concentrations are predicted to be above 88 mpn/100 ml. This prohibition makes the harvest of shellfish from these areas illegal. The aerial extent of the prohibition extends to where the predicted bacteria concentrations are above three mpn/100 ml. Based on this information, the point sources were not expected to impact the condemned area which occurs outside of the prohibited area and the condemned areas were modeled as stand alone units. Therefore, no WLAs were provided in these TMDLs as there were no point sources within the modeled units. This information was obtained from an August 08, 2005 letter from DSS to VADEQ.

There are several municipalities which contain municipal separate storm sewer systems (MS-4s) within the impaired watersheds. These systems are permitted through the NPDES program and convey surface water runoff within the area to the impaired basins. These diffuse sources enter the stream system from multiple points and often overlap within basins. The modeling system used by the state for these TMDLs was not complex enough to model individual WLAs for each jurisdiction. A lumped WLA was provided in each TMDL for the applicable MS-4 jurisdictions. The MS-4 permits for each of the impaired watersheds are

provided in Table 3. The total loading was determined by multiplying the weighted impervious surface area by the allowable load.

Table 3 – MS-4 Facilities in the Impaired Waters

Basin	Jurisdiction	Permit Number
Poquoson River and Back Cr	York County	VAR040028
	City of Poquoson	VAR040024
	City of Hampton	VA0088633
Back River	York County	VAR040028
	City of Poquoson	VAR040024
	City of Hampton	VA0088633
	Langley Air Force Base	VAR040092

### Load Allocations

According to Federal regulations at 40 CFR § 130.2(g), LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible, natural and nonpoint source loads should be distinguished.

LAs were developed for each of the four bacterial source categories (human, pets, livestock and wildlife). The loadings were not developed on a landuses basis. The implementation techniques needed to insure compliance with the TMDL will be applied to the landuse for the applicable sources. Table 4 documents the LAs for each source category of coliform bacteria.

Table 4- Load Allocations by Source

Segment/ Watershed	Condemnation	Human (mpn/day)	Pets (mpn/day)	Livestock (mpn/day)	Wildlife (mpn/day)
Chisman Cr	137A	0.00	0.00	0.00	4.64E+11
Unnamed Cove	137B	0.00	0.00	0.00	1.15E+09
Patrick's Cr	137C	0.00	8.92E+09	0.00	1.10E+10
Poquoson River	137D	0.00	0.00	0.00	2.11E+11
Lambs Cr	137E	0.00	2.57E+08	0.00	7.00E+10
Roberts Cr	137F	0.00	0.00	4.38E+09	1.29E+10
Lyons Cr		5.18E+09	4.19E+09	1.57E+10	1.57E+10
Whitehouse Cove	137G	0.00	0.00	0.00	8.54E+10
Bennett Cr		8.86E+08	2.56E+09	5.51E+09	5.90E+09
Eastern Cove		5.94E+08	2.04E+09	8.44E+09	8.79E+09
Back Cr	151	0.00	9.86E+10	5.34E+10	9.86E+10

Topping Cr	54-21A	8.41E+09	1.00E+09	1.03E+10	6.35E+09
Cedar Cr	54-21B	0.00	0.00	0.00	1.60E+10
NW Br Back River	54-21C	0.00	0.00	0.00	8.64E+10
SW Br Back River	54-21E	0.00	0.00	0.00	1.13E+12
Tabbs Cr	54-21D	0.00	0.00	0.00	2.55E+10
Inlet #1	54-21F	0.00	0.00	0.00	6.35E+09
Harris River	54-21G	0.00	2.60E+09	0.00	2.44E+11
Inlet #2	54-21H	0.00	5.15E+09	2.34E+08	2.63E+09
Wallace Cr	54-21H	1.58E+09	2.74E+08	1.12E+10	7.13E+09
Front Cove	54-193A	2.86E+09	3.32E+08	7.96E+09	4.81E+09
Long and Grunland Cr	54-158	0.00	2.46E+10	0.00	3.74E+10

*3) The TMDLs consider the impacts of background pollution.*

Background pollutant contributions were considered in the TMDL development process by quantifying the fecal coliform loads from wildlife sources through the use of BST data.

*4) The TMDLs consider critical environmental conditions.*

According to the EPA regulation 40 CFR § 130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of impaired waters is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards<sup>1</sup>. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable “worst-case” scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum. These critical conditions ensure that water quality standards will be met for other than worst case scenarios. By quantifying the TMDL load reductions to the more stringent criteria and evaluating a 30-month data period, the TMDLs are insuring that the standards are maintained during critical conditions. The primary contact TMDLs were modeled to critical conditions by basing the loadings on the maximum observed concentration.

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<sup>1</sup>EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.



*5) The TMDLs consider seasonal environmental variations.*

Seasonal variations involve changes in stream flow as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods. Source loadings were investigated on a monthly basis to determine if seasonality existed, based on the results it was determined that there were minimal seasonal impacts to loading and the source loads were averaged on an annual basis.

*6) The TMDLs include a margin of safety.*

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. The MOS may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL. Virginia included an implicit MOS in the TMDLs for the impaired waters by targeting reductions to the highest level at which observed concentrations exceeded the water quality standard. The Commonwealth intends to eliminate all human loadings to the impaired waters even if these reductions are not required to meet the criterion.

*7) There is a reasonable assurance that the TMDLs can be met.*

EPA requires that there be a reasonable assurance that the TMDL can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR § 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint Source Program.

*8) The TMDLs have been subject to public participation.*

Two public meetings were held for each of these TMDLs. The meetings were noticed in the Virginia Register and the TMDLs were subjected to a 30-day comment period. DEQ responded to any comments submitted by the public. Table 5 documents the dates of the public meetings for each TMDL.

Table 5 – Public Meeting Dates

Watershed	1 <sup>st</sup> Public Meeting	2 <sup>nd</sup> Public Meeting
Poquoson River and Back Creek	July 20, 2005	March 16, 2006
Back River	September 14, 2005	March 23, 2006